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Attorney Docket: NEX82/D

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	RUCKMAN, ET AL.		
SERIAL NO.:	10/024,997	EXAMINER:	FORMAN, B.J.
FILED:	DECEMBER 18, 2001	ART UNIT:	1634
TITLE:	NUCLEIC ACID LIGANDS TO INTEGRINS	CONF. NO.:	8763

Mail Stop Appeal Brief
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO OFFICE COMMUNICATION

Sir:

A communication in the above-captioned matter was mailed on October 28, 2005. The communication indicated that the Appeal Brief mailed on April 13, 2005 was defective in that the brief did not contain an Evidence Appendix, including copies of any evidence entered and relied upon, nor did it contain a Related Proceedings Appendix. The enclosed CORRECTED APPEAL BRIEF corrects this deficiency.

Applicant believes that the Corrected Appeal Brief is acceptable. It is believed no fees are due with this submission; however, the undersigned hereby authorizes the charge of any fees created by the filing of this document or any deficiency of fees submitted herewith to be charged to deposit account No. 19-5117.

Respectfully submitted,

Date: November 1, 2005

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37 CFR 1.8
CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to:

Mail Stop: Appeal Brief: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on 11/1/05.

Signature:
Name: Tasha L. Pierce

Attorney Docket: NEX82/D

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CORRECTED APPEAL BRIEF

Sir:

In regard to the referenced application, Appellant submits this Appeal Brief.

I. REAL PARTY IN INTEREST

The real party in interest is Gilead Sciences, Inc. The right of Gilead Sciences, Inc. to take action in the subject application was established by virtue of the following chain of title:

1. An assignment from the inventors to NeXstar Pharmaceuticals, Inc. recorded at Reel 010271, Frame 0139.

2. An assignment from NeXstar Pharmaceuticals, Inc. to Gilead Sciences, Inc., recorded at Reel 012399, Frame 0838.

II. RELATED APPEALS AND INTERFERENCES

The undersigned legal representative of Appellant hereby confirms that there are no known appeals or interferences relating to the present application, or any parent application, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

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37 CFR 1.8
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Signature: Tasha L. Pierce
Name: Tasha L. Pierce

III. STATUS OF THE CLAIMS

Claims 4-5 are pending in the application. No claims have been allowed. Claims 1-3 and 6-7 have been cancelled. Claims 4-5 stand rejected under a final Office Action mailed September 7, 2004.

The rejections of each of claims 4-5 are being appealed.

IV. STATUS OF THE AMENDMENTS

In response to the final Office Action of September 7, 2004, no amendment was filed.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Claim 4 is directed to method for detecting a deep vein thrombosis in an individual, the method comprising providing a nucleic acid ligand to a β3 integrin, said nucleic acid ligand conjugated to a radioactive label; administering said nucleic acid ligand to said individual; and detecting the site of said thrombosis by analyzing the localization of said nucleic acid ligand using a radioimaging technique. This is described in the specification at page 10, lines 17-25; page 21, lines 22-26; page 31, line 1, to page 32, 13; and Figure 6.

Claim 5 is directed to an anti-clotting composition for use in acute coronary syndromes and percutaneous coronary intervention, the composition comprising a nucleic acid ligand to a β_3 integrin and a pharmaceutically-acceptable excipient. This is described in the specification at page 10, lines 17-25; and page 21, lines 13-21.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 4-5 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement, and as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention.

VII. ARGUMENT

A. The Rejection of Claims 4-5 under 35 U.S.C. § 112, first paragraph

1. Statement of the Relevant Law Pertaining to 35 U.S.C. § 112, first paragraph rejections.

The first paragraph of Section 112 requires that a patent application be written so as to "enable any person skilled in the art to which it pertains . . . to make and use the same." A specification is presumed to be enabling absent "a reason to doubt the objective truth of the statements contained therein." *In re Marzocchi*, 439 F.2d 220, 223, 169 U.S.P.Q. 367, 369 (C.C.P.A. 1971).

A specification "may be enabling even though some experimentation is necessary," *United States v. Teletronics, Inc.*, 857 F.2d 778, 785, 8 U.S.P.Q.2d 1217, 1223 (Fed. Cir. 1988), so long as the amount of experimentation required is not "undue experimentation." *In re Wands*, 858 F.2d 731, 737, 8 U.S.P.Q.2d 1400, 1404 (Fed. Cir. 1988). The test is whether the specification "provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed." *Id.* The fact that experimentation may be complex does not necessarily make it undue, if the art typically engages in such experimentation. *Id.*. Further, it is a tenet of patent law that an applicant need not teach what the skilled artisan already knows. Instead, it is preferred that an applicant "omits what is well known in the art." *Hybritech Inc. v. Monoclonal Antibodies*, 802 F.2d 1367,1384, 231 U.S.P.Q. 81, 94 (Fed. Cir. 1986). In addition, even in an unpredictable art, it is unnecessary to disclose examples for each claimed species. *In re Angstadt*, 537 F.2d 498, 502, 190 U.S.P.Q. 214, 218 (C.C.P.A. 1976). It has been determined by the courts that no working examples are required to enable a patent application. *In re Borkowski*, 422 F.2d 904, 908, 164 U.S.P.Q. 642, 645 (C.C.P.A. 1970).

On the basis of animal studies, and controlled testing in a limited number of humans (Phase I testing) the Food and Drug Administration may authorize Phase II clinical studies; however, FDA approval is not a prerequisite for finding a compound patentable within the meaning of the patent laws. *Scott v. Finney*, 34 F.3d 1058, 1063, 32 U.S.P.Q.2D 1115, 1120 (Fed. Cir. 1994). Applicants are not required to demonstrate that a therapeutic agent based on a claimed invention is a safe or fully effective drug for humans. MPEP § 2107(III) and cases cited therein.

For each claim drawn to a genus, the written description requirement for a claimed genus may be satisfied through sufficient description of a representative number of species by actual reduction to practice, reduction to drawings, or by disclosure of relevant, identifying characteristics, *i.e.*, structure or other physical and/or chemical properties, by functional

characteristics coupled with a known or disclosed correlation between function and structure, or by a combination of such identifying characteristics, sufficient to show the applicant was in possession of the claimed genus. A "representative number of species" means that the species which are adequately described are representative of the entire genus. What constitutes a "representative number" is an inverse function of the skill and knowledge in the art. The Guidelines for Examination of Patent Applications Under the 35 U.S.C. § 112, 1, "Written Description" Requirement, 66 Fed. Reg. 1099, 1101 (January 5, 2001). Indeed, there are situations where one species adequately supports a genus. *See, e.g., In re Rasmussen*, 650 F.2d 1212, 1215, 211 U.S.P.Q. 323, 326-27 (C.C.P.A. 1981) (quoting *In re Smythe*, 480 F.2d 1376, 1384, 178 U.S.P.Q. 279, 285 (C.C.P.A. 1973)); *In re Herschler*, 591 F.2d 693, 700, 200 U.S.P.Q. 711, 714 (C.C.P.A. 1981). A number of factors must be weighed in view of the level of skill and the knowledge in the art in light of the written description. Patents and printed publications in the art should be relied upon to determine whether an art is mature and what the level of knowledge and skill is in the art. *See*, Written Description Guidelines at 1106.

2. The Rejection of Claims 4-5 under 35 U.S.C. § 112, first paragraph is improper.

i. Claim 4.

Claim 4 is directed to a method for detecting DVT. Claim 4 has been rejected under 35 U.S.C. § 112, first paragraph, because the specification allegedly provides no teaching of detecting DVT , the level of predictability in detecting DVT is low, the specification does not teach a relationship between the claimed nucleic acid ligands and detecting DVT, the specification provides no examples of detecting DVT in an individual, but merely teaches the localization of one aptamer to an induced clot in a rabbit, and that undue experimentation would be required to detect DVT. Appellant notes that while the rejection is indicated as being an enablement rejection, the language of the rejection is consistent with a written description rejection in some instances. Appellant's remarks are therefore directed to the rejection's language.

Appellants respectfully assert that the specification and prior art provide evidence of a correlation between binding to β_3 integrin and detecting DVT in individuals, and that the claim is fully enabled.

Detecting thrombus formation, including DVT, with a radiolabeled β_3-binding agent is well-known in the art. Reports of thrombus detection, including DVT detection, using radiolabeled fibrinogen (which binds to $\alpha_{IIb}\beta_3$) date back to at least the mid-1970s. (*See* Harwig, et al., *In Vivo* Behavior of 99mTc-Fibrinogen and its Potential as a Thrombus-Imaging Agent, *J Nucl Med.* 1976 Jan;17(1):40-6; and Jonckheer, et al, The Interpretation of Phlebograms Using Fibrinogen Labeled with 99 mTc, *Eur J Nucl Med.* 1978;3(4):233-8 (abstracts enclosed)). Numerous additional reports of radiolabel-mediated detection of thrombi can be found in this time period (*e.g.*, a search in MEDLINE for "dvt imaging 99mtc" from 1980-1989 returns 40 reports.) More recent reports describe radioimaging of thrombi with $\alpha_{IIb}\beta_3$ (also referred to as GPIIbIIIa) antagonists. (*See, e.g.*, Barrett, et al., Biological Evaluation of Thrombus Imaging Agents Utilizing Water Soluble Phosphines and Tricine as Coligands When Used to Label a Hydrazinonicotinamide-Modified Cyclic Glycoprotein IIb/IIIa Receptor Antagonist with 99mTc, *Bioconjug Chem.* 1997 Mar-Apr;8(2):155-60; and Mousa, et al., Novel Technetium-99m-labeled Platelet GPIIb/IIIa Receptor Antagonists as Potential Imaging Agents for Venous and Arterial Thrombosis, *Coron Artery Dis.* 1998;9(2-3):131-41 (abstracts enclosed)). The prior art clearly supports a correlation between β_3-binding molecules and the ability to detect thrombi, including DVT.

Furthermore, the illustrative examples provided in the specification teach a method of making and using a β_3 integrin nucleic acid ligand to bind to β_3. Example 2 discloses the generation of nucleic acid ligands to integrins. Example 3 discloses specificity of the identified ligands to integrins. These working examples provide guidance for the steps necessary in order to recognize or identify any binding to β_3 by a β_3 nucleic acid ligand in conditions or diseases mediated by β_3. No working examples are required to enable a patent application. The specification, however, provides specific examples. Example 4 discloses the specificity of a representative ligand in an *in vitro* system. Example 5 further discloses binding of a representative ligand to human platelets in an *in vitro* model system. The specification, also provides a specific *in vivo* Example, Example 6, which indicates the specificity and efficacy of an exemplary ^{99m}Tc-labeled ligand in the claimed method in a rabbit venous clot model system. The *in vivo* or *in vitro* models exemplified in the Examples reasonably correlate to the claimed method.

The rejection implies that the rabbit model is not satisfactory for studying the behavior of an agent in a human. Applicant asserts that the rabbit animal model is appropriate, and reasonably correlates to the claimed method, meeting the criteria for enablement. While some experimentation may be necessary to develop specific experimental protocols for imaging DVT with ligands to β_3, such experimentation is not undue, but rather routine in the art, as evidenced by the enclosed abstracts.

Thus, the knowledge available to one of skill in the art regarding imaging of DVT with integrin-binding molecules, taken together with the disclosure provided regarding radioimaging of DVT with an exemplary β_3 ligand present in the specification, is sufficient to enable one of skill in the art to perform the claimed methods of detecting DVT. The rejection's statement that there is no teaching of detecting DVT in an individual (page 4) utilizes an incorrect standard for rejecting the claims. As explained above, the teachings in the specification regarding integrin-binding agents and their use in DVT detection, coupled with *in vitro* and *in vivo* models with integrin-binding ligands reasonably correlate to the claimed method of detecting DVT, which is all that is required to meet the enablement standard. The rejection's statement that the specification does not teach a relationship between the claimed ligands and detecting DVT (page 4) similarly overlooks the teachings of the specification and the knowledge available to one of skill in the art treating DVT.

ii. Claim 5.

Claim 5 claims an anti-clotting composition for use in acute coronary syndromes and percutaneous coronary invtervention. Claim 5 has been rejected under 35 U.S.C. § 112, first paragraph, because an anti-clotting composition with any ligand of β_3 is allegedly not taught, the specification fails to teach anti-clotting applications, the level of predictability in the anti-clotting art is low, no working examples are provided, and undue experimentation would be required to develop an anti-clotting agent.

Appellants respectfully assert that the specification and prior art provide evidence of a correlation between binding to β_3 integrin and anti-clotting applications, contrary to the assertion of the rejection (page 4).

The specification explains that $\alpha_{IIb}\beta_3$ is the major integrin on the surface of platelets where it mediates the adhesion of activated platelets to the plasma protein fibrinogen, and that during clot formation, fibrinogen dimers cross-link platelets to one another through the integrin

receptor. Activation of platelets by ADP, epinephrine, collagen or thrombin leads to a dramatic enhancement in binding activity of integrin ligands. (Specification, page 6, lines 1-20). The specification further provides examples of $\alpha_{IIb}\beta_3$-binding molecules which are approved anti-clotting drugs, Aggrastat, Integrilin, and ReoPro. These drugs are approved for acute coronary syndrome and/or in patients who are undergoing percutaneous coronary intervention; that is, indications where thrombus (clot) formation is suspected or is likely. (Specification, page 6, lines 21-30). The prior art clearly supports a correlation between β_3-binding moleculés, binding to activated platelets, and anti-clotting activity.

Furthermore, the illustrative examples provided in the specification teach a method of making and using a β_3 integrin nucleic acid ligand to bind to activated platelets in Example 5. As explained above, a rigorous or an invariable exact correlation between an *in vivo* or *in vitro* model and the claimed method is not required, rather, only a reasonable correlation is necessary. That is, the specification may be enabling even though some experimentation is necessary, as long as a reasonable amount of guidance is provided with respect to the direction in which the experimentation should proceed. Additionally, it is unnecessary to disclose examples for each claimed species. While some experimentation may be necessary to develop specific anti-clotting compositions comprising ligands to β_3, such experimentation is not undue, but rather routine in the art, as evidenced by the existence of the numerous approved anti-clotting drugs, Aggrastat, Integrilin, and ReoPro, which bind to $\alpha_{IIb}\beta_3$ on activated platelets.

Thus, the knowledge available to one of skill in the art, taken together with the disclosure provided regarding binding to activated platelets with an exemplary β_3 ligand, is sufficient to enable one of skill in the art to prepare the claimed anti-clotting composition. The rejection's statement that there is no teaching of an anti-clotting applications (page 4) utilizes an incorrect standard for rejecting the claims. The rejection's statement that the specification does not teach a relationship between the claimed ligands and as an anti-clotting agent (page 4) similarly overlooks the teachings of the specification and the knowledge available to one of skill in the art in anti-clotting compositions.

VIII. CLAIMS APPENDIX

4. A method for detecting a deep vein thrombosis in an individual, the method comprising:

(a) providing a nucleic acid ligand to a β_3 integrin, said nucleic acid ligand conjugated to a radioactive label;

(b) administering said nucleic acid ligand to said individual;

(c) detecting the site of said thrombosis by analyzing the localization of said nucleic acid ligand using a radioimaging technique.

5. An anti-clotting composition for use in acute coronary syndromes and percutaneous coronary intervention, the composition comprising a nucleic acid ligand to a β_3 integrin and a pharmaceutically-acceptable excipient.

IX. EVIDENCE APPENDIX

Enclosed please find copies of the following references of record in this appeal:

Harwig, et al., J Nucl Med. 1976 Jan;17(1):40-6. In vivo behavior of 99mTc-fibrinogen and its potential as a thrombus-imaging agent. (abstract only)

Jonckheer, et al., Eur J Nucl Med. 1978;3(4):233-8. The interpretation of phlebograms using fibrinogen labeled with 99 mTc. (abstract only)

Barrett, et al., Bioconjug Chem. 1997 Mar-Apr;8(2):155-60. Biological evaluation of thrombus imaging agents utilizing water soluble phosphines and tricine as coligands when used to label a hydrazinonicotinamide-modified cyclic glycoprotein IIb/IIIa receptor antagonist with 99mTc. (abstract only)

Mousa, et al., Coron Artery Dis. 1998;9(2-3):131-41. Novel technetium-99m-labeled platelet GPIIb/IIIa receptor antagonists as potential imaging agents for venous and arterial thrombosis. (abstract only)

X. REPLATED PROCEEDINGS APPENDIX

There are no related proceedings.

XI. CLOSING REMARKS

For the foregoing reasons, Appellant submits that the lack of enablement of claims 4-5 has not been established, and that the claims are therefore patentable. The fee for this Appeal Brief ($500.00) was previously paid. It is believed that no other fees are due with this Appeal Brief. If this is in error, please charge any additional fees to Deposit Account No. 19-5117.

Respectfully submitted,

Date: November 1, 2005

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1: Coron Artery Dis. 1998;9(2-3):131-41.

Novel technetium-99m-labeled platelet GPIIb/IIIa receptor antagonists as potential imaging agents for venous and arterial thrombosis.

Mousa SA, Bozarth JM, Edwards S, Carroll T, Barrett J.

The DuPont Merck Pharmaceutical, Cardiovascular Division, Wilmington, Delaware 19880-0400, USA.

OBJECTIVES: Either venous or arterial thrombosis is a potentially life-threatening event and existing diagnostic modalities are inadequate to diagnose and to determine the morphology of the evolving thrombus. Thus development of a noninvasive imaging agent that can detect clot location remains a critical and unmet need in nuclear diagnostic medicine. The present study was undertaken to determine the potential of platelet GPIIb/IIIa receptors compared with direct thrombin inhibitors, in the detection of venous and arterial clots. METHODS: Initially, the validity of exploiting the degree and extent of specific uptake and retention of a potent GPIIb/IIIa receptor antagonist in venous and in arterial thrombus was confirmed in vitro in artificially created arterial- or venous-type clots, using the radiolabeled antagonist, 3H-DMP728. This was followed by comparing the in-vivo clot/blood distribution of various technetium-99m (99mTc)-labeled, DMP728-derived, GPIIb/IIIa receptor antagonists and of thrombin inhibitors, over time, in mixed arterial/venous or venous clots in arteriovenous shunt and in venous clot models in dogs. In addition, we performed noninvasive single-photon emission tomographic imaging of the venous clot in a deep vein thrombosis model in dogs. RESULTS: Our data confirmed that potency for the platelet GPIIb/IIIa receptors was maintained after radiolabeling of the parent active GPIIb/IIIa receptor antagonists. DMP728 demonstrated a relatively greater affinity for activated than for unactivated human platelets, which might be essential for attaining an optimal thrombus/blood (target/background) distribution ratio and the optimal detection of small clots (i.e. greater sensitivity). CONCLUSIONS: These data suggest a potential utility of 99mTc-GPIIb/IIIa receptor antagonists, but not of direct thrombin inhibitors, in the diagnosis of venous clots in deep vein thrombosis, pulmonary embolism and arterial thromboembolic disorders including stroke and coronary and peripheral artery thrombotic disorders.

PMID: 9647415 [PubMed - indexed for MEDLINE]

1: Bioconjug Chem. 1997 Mar-Apr;8(2):155-60.

Biological evaluation of thrombus imaging agents utilizing water soluble phosphines and tricine as coligands when used to label a hydrazinonicotinamide-modified cyclic glycoprotein IIb/IIIa receptor antagonist with 99mTc.

Barrett JA, Crocker AC, Damphousse DJ, Heminway SJ, Liu S, Edwards DS, Lazewatsky JL, Kagan M, Mazaika TJ, Carroll TR.

DuPont Merck Pharmaceutical Company, Radiopharmaceuticals Division, North Billerica, Massachusetts 01862, USA.

A hydrazinonicotinamide-functionalized cyclic glycoprotein IIb/IIIa (GPIIb/IIIa) receptor antagonist [cyclo(D-Val-NMeArg-Gly-Asp-Mamb(5-(6-(6-hydrazinonicotin amido)hexanamide))) (HYNICtide)] was labeled with 99mTc using tricine and a water soluble phosphine [trisodium triphenylphosphine-3,3',3"-trisulfonate (TPPTS); disodium triphenylphosphine-3,3'-disulfonate (TPPDS); or sodium triphenylphosphine-3-monosulfonate (TPPMS)] as coligands. Three complexes, [99mTc(HYNICtide)(L)(tricine)] (1, L = TPPTS; 2, L = TPPDS; 3, L = TPPMS), were evaluated in the canine arteriovenous shunt (AV shunt) model and canine deep vein thrombosis imaging (DVT) model. All three agents were adequately incorporated into the arterial and venous portions of the growing thrombus (7.8-9.9 and 0.2-3.7% ID/g, respectively) in the canine AV shunt model. In the canine DVT model all three complexes had thrombus uptake that far exceeded the negative control, [99mTc]albumin. The findings indicate similar incorporation into a venous thrombus (% ID/g = 2.86 +/- 0.4, 3.4 +/- 0.9, and 3.38 +/- 1.1 for complexes 1, 2, and 3, respectively) and similar blood clearance with a t1/2 of approximately 90 min. Gamma camera scintigraphy allowed visualization of deep vein thrombosis in as little as 15 min with the thrombus/muscle ratios being 3.8 +/- 0.8, 2.8 +/- 0.4, and 3.0 +/- 0.8 for complexes 1, 2, and 3, respectively. The visualization of the thrombus improved over time, and the thrombus/muscle ratios were 9.7 +/- 1.9, 13.8 +/- 3.6, and 9.4 +/- 2 for complexes 1, 2, and 3, respectively, at 120 min postinjection. The administration of complexes 1-3 did not alter platelet function, hemodynamics, or the coagulation cascade. Furthermore, complexes 1-3 did not significantly differ in their uptake into the growing thrombus, blood clearance, and target to background ratios. Therefore, all three complexes have the capability to detect rapidly growing venous and arterial thrombi.

PMID: 9095355 [PubMed - indexed for MEDLINE]

1: J Nucl Med. 1976 Jan;17(1):40-6.

In vivo behavior of 99mTc-fibrinogen and its potential as a thrombus-imaging agent.

Harwig SS, Harwig JF, Coleman RE, Welch MJ.

We have investigated the in vivo behavior of 99mTc-fibrinogen, prepared by a mild and efficient electrolytic method employing tin electrodes. The clearance mechanisms of this agent were studied, and its efficacy for imaging deep-vein thrombi in dogs with an Anger camera was determined. The 99mTc-fibrinogen preparations, which are stable in vitro, undergo partial rapid exchange of the technetium with other plasma proteins and with anions of the blood buffer system in vivo, resulting in an early drop in the percent of radioactivity associated with clottable protein. However, very little or no oxidation to pertechnetate occurs. The nonclottable material is much more rapidly cleared from the blood than the remaining 99mTc-fibrinogen, and the proportion of clottable protein activity increases with time. The fraction of 99mTc-fibrinogen that remains intact in vivo is biologically active and will incorporate into thrombi. Higher thrombus-to-blood activity ratios are obtained with 99mTc-fibrinogen than with radioidinated fibrinogen when both agents are injected into dogs 4 hr after induction of femoral vein thrombosis. Clearly delineated images of the thrombi are obtained, beginning about 2.5 hr after injection. Thus, 99mTc-fibrinogen may be of clinical use as a thrombus-imaging agent in patients under-going active thrombosis, especially in regions of high blood pool.

PMID: 1244446 [PubMed - indexed for MEDLINE]

1: Eur J Nucl Med. 1978;3(4):233-8.

The interpretation of phlebograms using fibrinogen labeled with 99 mTc.

Jonckheer MH, Abramovici J, Jeghers O, Dereume JP, Goldstein M.

A new method for the detection of deep-vein thrombosis is presented, consisting of a single antecubital injection of fibrinogen labeled with 99mTc. This atraumatic procedure allows one to visualize the large veins of the lower limbs, the venae iliacae and the distal part of the vena cava inferior. This paper discusses how to interpret these phlebograms.

PMID: 720353 [PubMed - indexed for MEDLINE]